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Impact of Exchange Rate Movements on the Mainland Economy

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Key points:

This study addresses the question of whether exchange rates can be an effective tool for macroeconomic control in China by examining the impact of renminbi exchange rate movements on the external sector and aggregate demand. The empirical analysis shows that an appreciation can reduce exports due to an expenditure-switching effect, and such an effect is likely to dominate other offsetting forces, resulting in a moderate contraction in aggregate demand. These findings suggest that the exchange rate can play a useful role in macroeconomic control in China.

Our empirical analysis also shows that strong global economic growth and China's continuous gain in the share of the world market have been propelling China's export growth and boosting trade surpluses in recent years, which more than counters any effects renminbi exchange rate movements might have. Also, China has been gaining competitiveness against competitors, which may also help explain the continuing strength in the external sector.

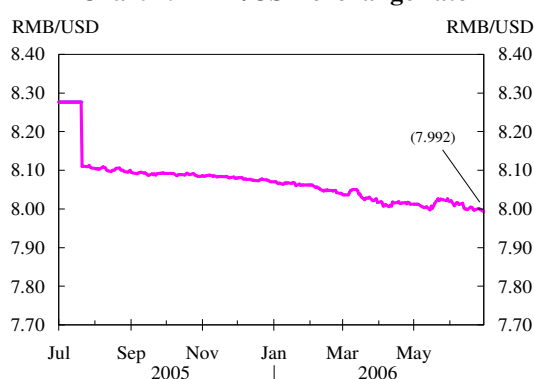
1. Introduction

An important move in Mainland China's (hence after China) exchange rate regime was made on 21 July 2005. Apart from a 2.1% re-valuation, it was announced that in the new framework, the renminbi would no longer be pegged to the US dollar, and its value would be determined based on market supply and demand with reference to a

basket of currencies. Following the announcement, other measures have been introduced to prepare the ground for greater flexibility, including a market-maker system, a more market-based mechanism to determine the daily central parity of the RMB/USD exchange rate, wider trading bands against non-US dollar currencies, and currency forward and swap contracts.

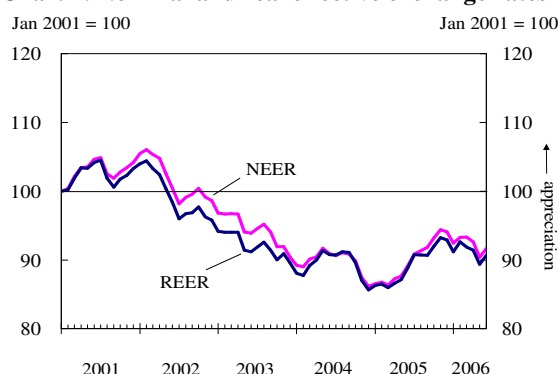
Despite the *de jure* abandonment of the US dollar peg and the subsequent build-up of the financial market infrastructure, the renminbi has remained largely stable against the US dollar, appreciating by only 1.5% in one year following the 2.1% revaluation (Chart 1). The currency's broad stability against the US dollar means that it has moved substantially in effective terms (Chart 2), given the strength of the US dollar. It appreciated by 8.8% in nominal effective terms in 2005 but declined by 3.9% since December 2005.

Chart 1. RMB/USD exchange rate



Source: CEIC.

Chart 2. Nominal and real effective exchange rates



Source: Staff estimates.

However, the Chinese economy has continued to power ahead despite the marked swings in the renminbi effective exchange rates. The effect of exchange rate fluctuations on the external sector appears to be minimal. Exports have largely maintained their strong growth momentum, and the trade surplus has risen from 1.7% of GDP in 2004 to 5.4% in the first half of 2006. Nor does overall growth seem to

have been affected by either the strengthening of the currency in effective terms in 2005 or the weakening of it in more recent months.

These observations raise a fundamental question as to whether changes in the renminbi exchange rate would affect the economy. Many China observers have advocated that the exchange rate should be used as a macroeconomic tool, and an appreciation is needed at this juncture to help cool down the economy. This policy advice hinges on the assumption that an appreciation will reduce exports and dampen aggregate demand. If that is not the case, the exchange rate will not be effective in macroeconomic control. The effectiveness of the exchange rate is a prerequisite for meaningful discussions over the role of exchange rate policy in macroeconomic management.

This paper attempts to address the question of whether the exchange rate would affect the Chinese economy. We will first examine the impact of exchange rate changes on exports and the trade balance, and try to explain why China's external sector has remained exceptionally strong despite the swings in the effective exchange rates. This will be followed by an assessment of the impact of exchange rate changes on aggregate demand. The final section will summarise the findings.

2. Impact on exports and trade balance

An expenditure-switching effect?

Exchange rate movements can affect exports and the trade balance through the expenditure-switching effect. In the case of a currency appreciation, domestic goods will become more expensive than foreign goods, restraining exports of goods and services. At the same time, it encourages

consumption of foreign goods and thus imports.

For the expenditure-switching effect to be strong enough to bring about a reduction in the trade surplus when a currency appreciates, a number of conditions need to be satisfied. First, there should be sufficient pass-through from exchange rate changes to a country's export prices and then to destination markets' import prices. Second, the Marshall-Lerner condition should hold, *i.e.* the sum of the price elasticities of exports and imports is greater than 1. That is, exports and imports need to be responsive enough to changes in prices in order to achieve a change in the trade balance.

Two types of evidence can be provided to assess the size of the expenditure-switching effect. The first is to examine the individual conditions such as the pass-through of exchange rates and price elasticity of trade, while the second directly studies the impact of exchange rate movements on exports and trade balance.

There is little direct evidence for China on exchange rate pass-through to trade prices due to a lack of data on trade prices, but there are some related factors that point to low exchange rate pass-through. These factors include China's role as a processing centre, and partial and falling pass-through in industrial economies.

Firstly, China's role as a processing centre may lower the sensitivity of export prices (and the external sector) to exchange rate changes. Currently more than 50% of China's exports are related to processing trade, whereby intermediate inputs produced elsewhere, particularly from countries in the region, are exported to China for the final assembly of finished products which are then exported to industrial countries. This type of trade might benefit from a renminbi appreciation, as its production costs can be reduced by lower input costs, which will

limit the rise in China's export prices in terms of foreign currencies.

Secondly, there is well documented evidence that in major industrial economies the pass-through from exchange rate changes to import prices is partial, and has declined in the past decade.¹ Ihrig, Marazzi and Rotheberg (2005) estimate that the exchange rate pass-through fell from near 0.7 in 1975-1989 to about 0.4 in 1990-2004 across the G-7 countries. Using cross country and time series evidence, Campa and Goldberg (2002) provide similar findings for a group of 25 OECD countries during the 1975-99 period. In this light, it is possible that changes in the renminbi effective exchange rates may not fully translate into changes in import prices of Chinese goods in their destination markets.

The second approach to study the expenditure-switching effect is to directly model the determinants of trade with the exchange rate as one factor. This is a reduced-form method in that the effect of exchange rate changes on trade has encompassed influences such as exchange rate pass-through to prices as well as responsiveness of trade to changes in prices.

A number of studies taking this approach (Cerra and Dayal-Gulati, 1999, and Cerra and Saxena, 2003) point out that price elasticity of Chinese exports changed over time as the export regime was gradually liberalised, and in fact the estimates changed the sign between early and later periods of their sample from early 1980s to 2001. However, there is no consensus on the size of price elasticity. Depending on the specifications, the estimates even for the more recent periods range from very little impact of exchange rate/price movements on exports, *e.g.* Eckaus (2004) and Kamada and Takagawa (2005), to a statistically significant negative impact, *e.g.* Liang and

¹ See Gust and Sheets (2006) for a brief survey on recent studies documenting partial and declining exchange rate pass-through to import prices.

Fung (2005) and Marquez and Schindler (2006).

Similarly, there has been conflicting evidence on the price responsiveness of imports. Liang and Fung (2005) find small, insignificant price elasticities of imports for the period of 1990-2004, but Cerra and Dayal-Gulati (1999) believe that market responsiveness of imports rose during in the 1980s and 90s, and find that price elasticity of imports became statistically significant in the late 90s.

Empirical evidence

We take the reduced-form approach to examine the impact of exchange rate changes by estimating export and trade balance equations using a small panel data set containing China's exports to the United States, the European Union and Japan between 1995 Q1 and 2006 Q1. Panel estimation is more powerful as it exploits variations both at the time series and cross sectional dimensions. The three economy-blocks account for 43% of China's total trade. They are also fairly representative of China's overall trade pattern. China runs sizeable trade surpluses with the US and EU, but deficits with many Asia economies due to processing trade. China has a small trade deficit with Japan.

An export equation is first estimated in an error correction form in which exports (x_t) are related to the real effective exchange rate ($reer_t$) as well as control variables including external demand (measured by individual G-3 economies' GDP, $wgdp_t$), and China's share in the global market (mkt_share_t) both in the short and long run. Except the market share variable, all variables are transformed into the logarithm. The specification of the export equation (with the expected signs for the coefficients) is given as:

(1)

$$\Delta_4 x_t = \beta_0 + \beta_1^{(-)} (x_{t-4}) + \alpha_1^{(-)} wgdp_{t-4} + \alpha_2^{(+)} reer_{t-4} + \alpha_3^{(-)} mkt_share_{t-4} + \beta_2^{(+)} \Delta_4 x_{t-1} + \beta_3^{(+)} \Delta_4 wgdp_t + \beta_4^{(-)} \Delta_4 reer_t + \beta_5^{(+)} \Delta_4 mkt_share_t$$

where:

x_t : China's exports in logarithm
 $wgdp_t$: G-3 economies' GDP in logarithm
 $reer_t$: real effective exchange rate of the renminbi in logarithm
 mkt_share_t : share of China's exports in the world's market.

In the equation, Δ_4 denotes 4-quarter differences, *i.e.* changes over a year. In the estimation, the fixed effects estimator is used to allow for different constants for individual economies in order to take into account heterogeneity across economies.

In the estimation, two measures of competitiveness are used. One is the conventional REER ($reer_t$) which uses bilateral trade shares to calculate the weighting scheme, and thus measures an economy's competitiveness relative to all of its trading partners including the destination markets. To capture the so-called 'third country' effect – the competition China faces with other trading nations in the third markets, a 'third country' REER ($reer3_t$) can be constructed utilising the data on exports of China's major competitors to the United States, the European Union, and Japan – the three major destination markets for China's exports.² An economy is

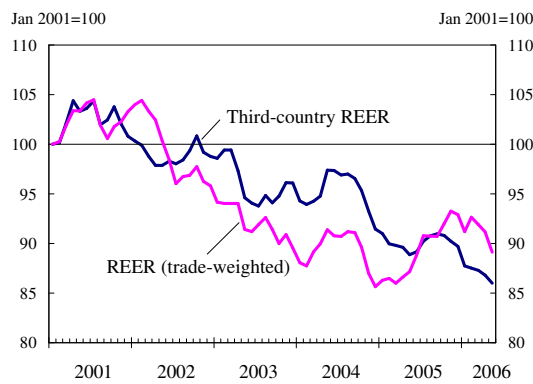
² The third country REER includes Mexico (0.19), Korea (0.15), Taiwan (0.11), Malaysia (0.09), Thailand (0.07), Indonesia (0.07), Brazil (0.07), Turkey (0.06), Singapore (0.06), India (0.05), the Philippines (0.04), Israel (0.03), and Vietnam (0.02). The weight for competitor j is defined as:

$$w_j = \frac{M_j^k}{\sum_k M_j^k} \frac{X_{CN}^k}{\sum_k X_{CN}^k}$$

where M_j^k = imports of country k (k = US, EU, and Japan) from competitor j

considered China's competitor if it exports similar products to the three destinations. The weights are determined by the export shares of China and her competitors in these major markets. Chart 3 shows that while the conventional REER appreciated noticeably in 2005 before weakening in the first half of 2006, the 'third country' REER points to a more or less continuous gain in competitiveness relative to China's competitors since mid-2004, reflecting greater currency appreciation in those economies.

Chart 3. Conventional and third-country REERs



Source: Staff estimates.

The estimated equations with both the long-run relationship and short-run dynamics are presented in Table A1 Columns 1-2. The long-run relationship with the conventional REER is given as:

(2)

$$x_t = -26.98 + 4.27 * wgd p_t - 1.32 * reer_t + 7.51 * mkt_share_t$$

(-10.05) (16.23)
(-6.62) (12.71)

The coefficient on the REER is statistically significant, and carries a negative sign. It

suggests that a 1% appreciation in the conventional REER will reduce exports by over 1% over the long run, but by a smaller amount in the short run. The effect of changes in the third country REER is slightly smaller. The estimates show that exchange rates have the expected expenditure-switching effect. Nevertheless, it appears that the conventional REER, which has fluctuated around a trend since 2004, may have under-estimated the competitiveness of China's exports. China's gain in competitiveness relative to its competitors may be one reason behind the sustained growth momentum in exports.

Earlier discussions raise the possibility that processing trade has reduced the sensitivity of exports to exchange rate changes. To explore this hypothesis, we estimate separate equations for total exports, processing trade and ordinary trade (using both the conventional REER and third country REER).³ As the disaggregate data for the two types of exports are not available on a by-country basis, we estimate their equations using world aggregates, rather than panel data.

According to the estimation presented in Tables A2-A3, there is some evidence that processing trade is more responsive than ordinary trade. Exchange rate movements do not have any impact on processing trade both in the short and long run, but have significant influence on ordinary trade. This provides some support to the hypothesis that processing trade has reduced the sensitivity of exports to exchange rate changes.

X_{CN}^k = exports of the Mainland to country k .

That is, the weighting for a competitor depends on the market share of the competitor in the destination market and the share of China's exports to that market.

³ Ordinary trade refers to goods imported into or exported from China that are (1) not subject to further processing and (2), in the case of exports, not assembled from imported components. Processing trade refers to three types of flow: (1) exports of components for assembly outside of China; (2) imports of components for assembly into exportables; and (3) exports of goods assembled using imported components.

The estimated export equations also show that the coefficients on external demand are of the expected positive sign both in the short and long run, and their magnitudes are much bigger than those for the REER, suggesting that global demand has a much stronger effect than the expenditure-switching effect due to exchange rate changes. Similarly, China's share in the destination markets also has a strong positive correlation with export performance.

The large impact of external demand and China's share in the global market may help explain the robust export growth despite the swings in the REER. The global economy has experienced strong growth in the last couple of years, expanding by 3.9% in 2005, compared to the 10-year average of 2.9%. This partly contributed to robust demand for China's exports, which expanded by 28.3% in 2005, much higher than the average of 18.4% in the last ten years.

Apart from world growth, China's gain in the world market is also a key driver of the strong growth in demand for China's exports. Between 2001 and 2005, China's trade share in global exports rose from 4.3% to 7.5%. This significant gain in the global market place may partly due to low production costs in China, but also reflects a higher degree of sophistication in China's export pattern (in terms of the range of products) than that of other economies' at a similar stage of development (Rodrik, 2006 and Schott, 2006). Employing product-level US import data, Schott (2006) compares China's exports to the US to those of other developed and developing economies. The overlap or similarity of China's exports with the OECD's is found to have increased dramatically during the sample period of 1972-2001, reflecting a large increase in China's export product penetration.

We also estimate a trade balance equation to assess the effect of exchange rate changes on net exports. As a reduced form, the equation contains the determinants of

exports and imports, relating trade balance (tb_t) to external competitiveness ($reer_t$), external demand ($wgdp_t$), China's share in the world market (mkt_share_t) and China's economic activity measured by GDP (dd_t):

(3)

$$\begin{aligned} \Delta_4 tb_t = & \beta_0 + \beta_1^{(-)} (tb_{t-4}) + \alpha_1^{(+)} dd_{t-4} + \alpha_2^{(-)} wgdp_{t-4} \\ & + \alpha_3^{(+)} reer_{t-4} + \alpha_4^{(-)} mkt_share_{t-4} \\ & + \beta_2^{(+)} \Delta_4 tb_{t-1} + \beta_3^{(-)} \Delta_4 dd_t + \beta_4^{(+)} \Delta_4 wgdp_t \\ & + \beta_5^{(-)} \Delta_4 reer_t + \beta_6^{(+)} \Delta_4 mkt_share_t \end{aligned}$$

where:

xt_t :	China's exports in logarithm
dd_t :	China's GDP in logarithm
$wgdp_t$:	G-3 economies' GDP in logarithm
$reer_t$:	real effective exchange rate of the renminbi in logarithm
mkt_share_t :	share of China's exports in the world's market.

The estimated equations are presented in Table A1 Columns 3-4. The estimation gives the following long-run relationship as:

(4)

$$\begin{aligned} tb_t = & -1.62 - 0.06 * dd_t + 0.22 * wgdp_t \\ & \quad (-9.65) \quad (-3.39) \quad (8.91) \\ & - 0.02 * reer_t + 0.24 * mkt_share_t \\ & \quad (-1.30) \quad (2.03) \end{aligned}$$

The estimates suggest that although the coefficient on the REER carries the expected negative sign, it is not statistically significant. The same is true when the third-country competition measure of the REER is used. These findings seem to suggest that while exchange rate movements can influence exports, they do not have much impact on the trade balance. This implies that the Marshall-Lerner condition is not satisfied, *i.e.* the sum of the price elasticities of exports and imports is not greater than 1. As exports are fairly elastic with respect to the exchange rate as established earlier, it can be inferred that imports are inelastic. This may reflect a number of factors. The presence of process trade means that a part of imports are required for production of

exports, and thus relatively stable and less affected by exchange rate fluctuations. Tariff reduction and other measures of trade liberalisation have encouraged imports, and the effect may dominate that of exchange rate changes. Also, there are substantial project related imports which are probably less price sensitive.

The estimates also suggest that external demand and China's market share in foreign markets are important determinants of the trade balance, which is consistent with findings from the export equations. In addition, economic growth in China is found to have a negative impact on the trade balance, as increased domestic demand raises imports.

Overall, the analysis in this section suggests that an appreciation of the renminbi has an expenditure-switching effect by reducing exports.

3. Impact on the aggregate demand

Is an appreciation contractionary or expansionary?

Conventional economic theories suggest that an appreciation of the exchange rate leads to a contraction in the aggregate

demand. This occurs if the expenditure-switching effect on exports and the spill-over effects on domestic demand dominate possible expansionary effects through the income and wealth channels. An appreciation will have a positive income effect if it leads to an improvement in the terms of trade, *i.e.* a rise in export prices relative to import prices. This will be the case if China's exporters and importers have some pricing power so that export prices are unchanged in the domestic currency while import prices decline.

In addition, the valuation effect brought about by a currency appreciation will increase or reduce a nation's wealth depending on its net foreign asset position. However, in terms of the effect on economic activity, what matters more is probably how the private sector's net wealth position is affected (see below).

Some quantitative gauges

Based on recently published data on China's net international investment position (IIP), some estimates on the potential valuation effect due to exchange rate changes are derived. According to the official data, China had net international assets of \$287.5 billion at the end of 2005, equivalent to 13% of GDP. Of the total net foreign assets, the government held \$825.7 billion worth of foreign exchange reserves, implying that the private sector was in a net liability position

Table 1. Wealth effect of a 10% renminbi appreciation (in % of GDP)

Net IIP		Change in net IIP: assuming different proportions of US dollar denominated assets	
		60%	80%
Overall	13	-1	-1
Government	37	-2	-3
Private sector	-24	1	2

Sources: State Administration of Foreign Exchange, and staff estimates.

of US\$538.2 billion. While the currency composition of China's foreign asset holdings is not revealed, it is generally estimated that the proportion of the US dollar denominated assets is in the range of 60-80%. For a 10% appreciation of the renminbi against the US dollar, the value of net assets of the government sector will be eroded by \$50-65 billion, or around 2-3% of GDP. In contrast, the private sector will gain by about 1.5-2% of GDP in wealth (Table 1).

Using China's trade data, it is estimated that a 10% gain in the terms of trade will represent an increase of income in the order of 1.7% of GDP.⁴ But as discussed earlier, changes in China's export and import prices depend on many factors other than the exchange rate. So a 10% appreciation of the exchange rate will unlikely translate into a 10% improvement in the terms of trade. For example, when the renminbi appreciated by 8.8% in nominal effective terms in 2005, the terms of trade improved by only 1.7%, suggesting a rise in income equivalent to 0.3% of GDP.

To gauge the overall macroeconomic impact of an exchange rate appreciation that encompasses various effects on external trade and domestic demand, we run simulations on a global macroeconomic model developed by the *Oxford Economic Forecasting*. The simulation suggests that a 10% appreciation of the renminbi in real effective terms has a modest macroeconomic impact, reducing GDP growth and inflation by around 1 percentage point a year relative to the baseline (Table 2). The negative impact largely falls on the external sector, with the trade balance falling by 2.5% of GDP over two years. On domestic demand, private consumption is little affected, but investment growth drops by 1.5 percentage points in two years, due to a cut-back in the export sector.

In sum, the evidence from this section suggests that the expenditure-switching effect of an appreciation is likely to dominate other offsetting forces such as a positive income effect, resulting in a moderate contractionary effect on the aggregate demand.

Table 2. Macroeconomic impacts of 10% REER appreciation

	Year 1	Year 2
GDP	-0.9	-0.9
Consumption	-0.2	-0.4
Investment	-0.6	-1.1
Exports	-0.7	-1.4
Imports	0.9	-1.1
Inflation	-0.7	-1.0
Trade balance (% of GDP)	-1.5	-1.1

Note: All figures represent deviations of year-on-year changes in percentage points from the baseline, unless otherwise specified.

Source: Staff estimates.

⁴ The terms of trade adjustment is calculated as $(X/P_m - X/P_x)$, where X is the total nominal value of exports, P_m is the import price index, and P_x is the export price index. If P_x increases faster or decreases slower than P_m , the terms of trade adjustment will be positive.

4. Conclusions

The empirical analysis in this paper shows that renminbi exchange rate movements can affect the Chinese economy. An appreciation has an expenditure-switching effect by reducing exports, as predicted by the conventional economy theory. Such an effect is found to dominate other expansionary forces such as the income effect in China, resulting in moderate contraction in aggregate demand.

There is also evidence that external demand and China's share in the global market have much bigger impacts on China's exports and trade balance, which helps explain the apparently limited impact of renminbi exchange rate movements on the economy in the last couple of years. The cyclical factor of current strong global growth and the structural factor of China's continuous gain in the world market have been propelling China's export growth and boosting trade surpluses in recent years,

more than countering any effects that exchange rates might have in the short term. In addition, the analysis suggests that China's external competitiveness may be more appropriately measured by the effective exchange rate index which takes into account the "third country" effect – competition China faces in the global market place from other trading nations, as compared to the conventional index which is calculated based on bilateral trade shares. Measured by this yardstick, China has been gaining competitiveness against her competitors in the last two years, which may also be one reason for China's continuing strength in exports.

Overall, the study has demonstrated an appreciation of the renminbi exchange rate can have a desired dampening effect on the macroeconomy, and help ease overheating pressures. Therefore, the exchange rate can be effective as a macroeconomic control tool.

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About the Author

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Appendix

Table A1. Determinants of China's trade balance and exports

	<u>Exports</u>		<u>Trade Balance</u>	
	<i>reer</i>	<i>reer3</i>	<i>reer</i>	<i>reer3</i>
Long-run relationships				
<i>dd_t</i>	-	-	-0.06 ***	-0.07 ***
			(-3.39)	(-3.93)
<i>wgdp_t</i>	4.27 ***	3.27 ***	0.22 ***	0.21 ***
	(16.23)	(13.41)	(8.91)	(8.07)
<i>reer_t</i>	-1.32 ***	-	-0.02	-
	(-6.62)	-	(-1.30)	-
<i>reer3_t</i>	-	-0.84 ***	-	0.00
	-	(-7.55)	-	(-0.64)
<i>mkt_share_t</i>	7.51 ***	9.83 ***	0.24 **	0.33 ***
	(12.71)	(17.75)	(2.03)	(3.04)
Short-run dynamics				
<i>ecm_{t-4}</i>	-0.20 ***	-0.23 ***	-0.21 ***	-0.19 ***
	(-3.23)	(-4.08)	(-3.68)	(-3.32)
<i>Δ₄tb_{t-1}</i>	-	-	0.76 ***	0.73 ***
	-	-	(13.27)	(12.73)
<i>Δ₄x_{t-1}</i>	0.68 ***	0.70 ***	-	-
	(12.82)	(14.05)	-	-
<i>Δ₄dd_t</i>	-	-	-0.02 **	-0.02 **
	-	-	(-2.61)	(-2.26)
<i>Δ₄wgdp_t</i>	1.43 ***	1.03 ***	0.05 **	0.05 **
	(4.34)	(3.51)	(2.55)	(2.52)
<i>Δ₄reer_t</i>	-0.48 ***	-	0.00	-
	(-5.05)	-	(-0.69)	-
<i>Δ₄reer3_t</i>	-	-0.27 ***	-	0.00
	-	(-4.63)	-	(-0.05)
<i>Δ₄mkt_share_t</i>	2.59 ***	3.03 ***	0.15 ***	0.14 ***
	(3.91)	(4.48)	(3.02)	(2.84)
Adjusted R ²	0.83	0.83	0.72	0.70
Number of observations	100	106	100	106
Test for fixed effects	372.17	329.43	70.23	92.05
p-value	[0.00]	[0.00]	[0.00]	[0.00]

Note: t-values are in (), p-values in []. *, ** and *** indicate that variables are significant at 10%, 5% and 1% levels respectively. Δ₄ represents a change over four quarters ago.

Source: Staff estimates.

Table A2. Determinants of processing and ordinary trade using REER

	<i>Overall exports</i>	<i>Processing trade</i>	<i>Ordinary trade</i>
REER			
<u>Long-run relationships</u>			
<i>world_gdp_t</i>	2.37 *** (8.01)	2.44 *** (7.46)	2.48 *** (5.99)
<i>reer_t</i>	-0.32 ** (-2.60)	-0.29 ** (-2.15)	-0.39 ** (-2.27)
<i>mkt_share_t</i>	22.35 *** (13.41)	21.52 *** (11.66)	21.55 *** (9.24)
<u>Short-run dynamics</u>			
<i>ecm_{t-4}</i>	-0.65 *** (-5.14)	-0.46 *** (-3.52)	-0.95 *** (-7.08)
$\Delta_4 cn_export_{t-1}$	0.32 *** (5.01)	0.43 *** (5.77)	0.22 *** (3.00)
$\Delta_4 world_gdp_t$	2.02 *** (8.14)	1.64 *** (5.72)	2.27 *** (6.67)
$\Delta_4 reer_t$	-0.25 *** (-3.30)	-0.30 *** (-3.78)	-0.14 (-1.23)
$\Delta_4 mkt_share_t$	13.69 *** (7.39)	10.80 *** (5.41)	16.31 *** (6.77)
Adjusted R ²	0.95	0.92	0.93
LM test for serial correlation: F-statistic	0.00 [0.99]	0.93 [0.34]	0.06 [0.81]
Jarque-Bera test for normality: $\chi^2(2)$	1.33 [0.52]	1.06 [0.59]	1.26 [0.53]
White test for heteroskedasticity: F-statistic	1.05 [0.43]	1.63 [0.15]	3.75 [0.00]
Ramsey RESET test for model specification: F-statistic	0.37 [0.55]	0.05 [0.82]	2.40 [0.13]

Table A3. Determinants of processing and ordinary trade using REER3

	<i>Overall exports</i>	<i>Processing trade</i>	<i>Ordinary trade</i>
REER3			
<u>Long-run relationships</u>			
<i>world_gdp_t</i>	2.03 *** (8.05)	2.72 *** (8.60)	1.45 *** (3.46)
<i>reer3_t</i>	-0.12 (-1.24)	0.05 (0.47)	-0.36 ** (-2.30)
<i>mkt_share_t</i>	24.44 *** (17.07)	20.75 *** (11.55)	26.93 *** (11.30)
<u>Short-run dynamics</u>			
<i>ecm_{t-4}</i>	-0.68 *** (-5.06)	-0.50 *** (-4.44)	-1.07 *** (-8.49)
$\Delta_4 cn_export_{t-1}$	0.31 *** (4.47)	0.48 *** (5.35)	0.26 *** (3.94)
$\Delta_4 world_gdp_t$	1.71 *** (6.81)	1.82 *** (5.30)	1.07 *** (3.33)
$\Delta_4 reer3_t$	-0.09 (-1.35)	-0.04 (-0.50)	-0.25 ** (-2.57)
$\Delta_4 mkt_share_t$	15.92 *** (7.77)	8.78 *** (4.35)	20.98 *** (7.88)
Adjusted R ²	0.94	0.89	0.93
LM test for serial correlation: F-statistic	0.34 [0.57]	0.00 [0.99]	0.03 [0.86]
Jarque-Bera test for normality: $\chi^2(2)$	1.05 [0.59]	0.09 [0.96]	0.11 [0.94]
White test for heteroskedasticity: F-statistic	1.76 [0.12]	1.20 [0.33]	3.35 [0.01]
Ramsey RESET test for model specification: F-statistic	0.08 [0.78]	1.63 [0.21]	12.91 [0.00]